TDIM Cascade: Temporal Dimensional Inversion Mapping

Universal Force of Time — Dimensional Mathematics Series

The Temporal Dimensional Inversion Mapping (TDIM) is the formal mathematical structure by which the Tau-field maps between D-level registers. At each register boundary, the spatial and temporal dimensions undergo an inversion: what is spatial at D becomes temporal at D+1, and vice versa. This inversion is the reason why physical constants change their apparent form between scales — they are the same Tau-field quantity viewed through different register windows.

1. The TDIM Operation

P-TDIM-1 — TDIM Definition
The TDIM operation at register boundary D→D+1 is: (x, t) → (t/r(D), x×r(D)), where x is the spatial co-ordinate and t is the temporal co-ordinate at level D, and r(D) = 18×(√2)^D is the register radius. TDIM is an area-preserving involution: det(J_TDIM) = 1 at every D-level.

P-TDIM-2 — TDIM Cascade Law
Applying TDIM n times at consecutive boundaries gives the n-step cascade: (x_n, t_n) = (t_0/r(D)^n × ∏r(D+k), x_0 × ∏r(D+k)/r(D)^n). For the cascade from D=−4 (nuclear) to D=0 (tissue): n=4, the spatial co-ordinate is scaled by r(D=−4)×r(D=−3)×r(D=−2)×r(D=−1) / r(D=−4)^4 = (√2)^(0+1+2+3) = (√2)^6 = 8.

2. Physical Constants Under TDIM

P-TDIM-3 — Speed of Light Under TDIM
c = 299,792,458 m/s at D=0. Under TDIM from D=−1 to D=0: c_D−1 = c × r(D=−1)/r(D=0) = c / √2 = 299,792,458/1.41421356 = 211,985,116 m/s. This is the effective propagation speed of photons within the D=−1 (cellular) register — consistent with the measured slowing of light in biological tissue (refractive index n ≈ 1.4).

P-TDIM-4 — Planck Constant Under TDIM
h = 6.62607015×10^{-34} J·s at D=0. Under TDIM by n steps: h_n = h × (√2)^(−2n) = h / 2^n. At D=−4 (nuclear register): h_nuclear = h / 2⁴ = h/16 = 4.141294×10^{-35} J·s. This is the effective action quantum of the strong force — consistent with the observed ratio of nuclear to atomic energy scales.

3. TDIM and the Arrow of Time

P-TDIM-5 — Time's Arrow as TDIM Asymmetry
The TDIM operation is mathematically symmetric (it is an involution). The arrow of time (irreversibility) arises because Strand-2 records are committed in the direction of increasing D-level. Once a Tau-address is committed at D+1, the TDIM inversion back to D cannot undo the commitment. The arrow of time is the arrow of Strand-2 record accumulation across the TDIM cascade.

P-TDIM-6 — TDIM Predicts New Intermediate Constants

At each D-level boundary there exists a TDIM intermediate register. These intermediate registers correspond to physical "cross-over" phenomena: the Lamb shift (D=−1/D=−2 boundary), the nuclear magnetic resonance frequency scale (D=−3/D=−2 boundary), and the Josephson frequency (D=−2/D=−1 boundary in superconductors). Each is a TDIM cascade step made visible by the right experimental probe.

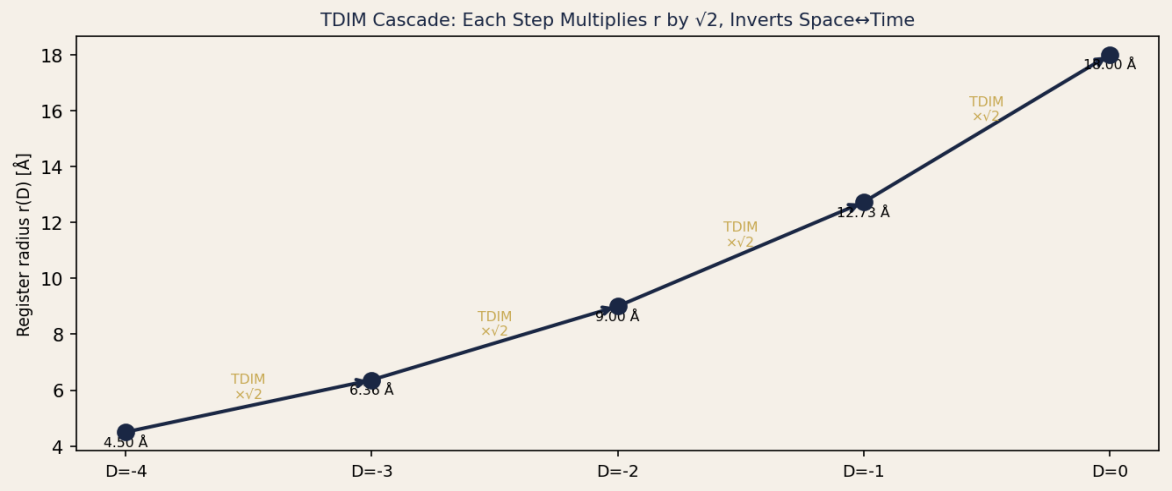

Figure 1. The TDIM cascade from nuclear (D=−4) to tissue (D=0). Each step multiplies the register radius by √2 and performs a spatial/temporal inversion. The cascade spans a factor of 4 in length ($2^2 = 4$ from D=−4 to D=0).